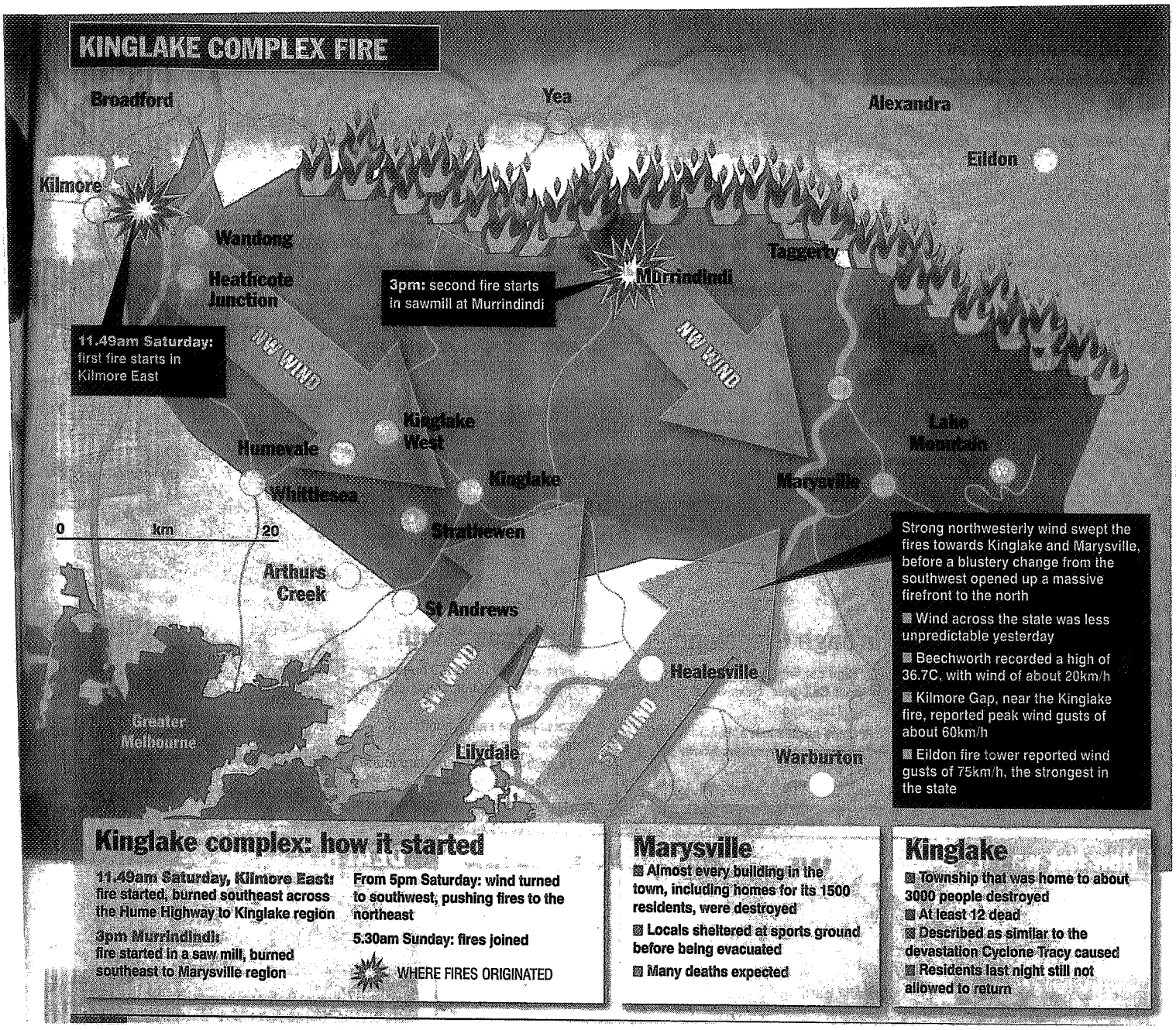


How hot was it?

Bushfire heat is measured in energy – the number of kilowatts per metre of the firefont

CFA crews won't send anyone to fight a fire of 4000kW/m

The Kinglake fire was 20,000 kW/m

This is the equivalent of 10,000 electric radiators

DSE spokesman Geoff Russell said sending firefighters to a blaze this hot would be "suicide"

ACTIVITY **4.1**

Bushfire intensity—page 1

Name:

Skills: understanding, numeracy

Bushfires range in intensity from small fires that do little damage to major bushfires that destroy whole forests and require home evacuations. The ferocity of a bushfire is called the fire intensity.

The fire intensity is a related to three things:

- the fuel consumed, measured in kilograms per square metre (W)
- the rate of spread of the fire, measured in metres per hour (R)
- the heat energy available in the fuel, measured in kilojoules per kilogram (H).

These three factors when multiplied together give a value for the fire intensity (I). Fire intensity is measured in kilowatts per metre:

$$I = H \times W \times R$$

The following table presents the relationship between fire intensity, its impact on the ecosystem and the difficulty in putting the fire out.

Fire intensity (kW)	Ecological impact	Difficulty of stopping fire
20–500	Low intensity, patchy burning, only reduces undergrowth. Rapid recovery of the ecosystem.	Relatively easy. Direct attack on the main fire front. Flames less than 2 metres in height and spread at speeds of less than 40 metres per hour.
500–1700	Moderate intensity with little damage to the ecosystem.	Direct attack on the main fire front or attacking the sides may stop fire.
1700–3500	Medium intensity. Trees are killed. Few or no unburnt areas left. Very slow recovery of the ecosystem.	Direct attack unlikely to succeed.
3500–7000+	High intensity. Extensive and long-lasting damage to the ecosystem.	Impossible to stop. Crown of trees on fire. Height of flames may be 70 metres and travel at speeds of up to 3 kilometres per hour.
20 000–60 000+	Extreme intensity. Ecosystem completely wiped out.	Impossible to stop. Mass fires and firestorms.

1 Define the term 'bushfire intensity'.

2 List the three factors that determine the fire intensity.

3 State the equation used to calculate the fire intensity.

4 Identify the units for each symbol in the equation.

Bushfire intensity—page 2

5 Calculate the fire intensity and assess its ecological impact for the following two cases:

a H = 4 kilojoules per kilogram
W = 10 kilograms per square metre
R = 50 metres per hour

b H = 4 kilojoules per kilogram
W = 50 kilograms per square metre
R = 200 metres per hour

6 You are employed as a fire control scientist. Your job is to use a control fire to reduce the amount of fuel available so that a large bushfire does not occur. The burn has to occur in an area where the fuel has a heat energy factor (H) of 4 kilojoules per kilogram and a rate of spread (R) of 5 metres per hour.

Before doing the burn an analysis of the area must be carried out to be sure that the fire will not get out of control.

Calculate the lower and upper limit of the amount of fuel in kilograms per square metre (W) that will allow a successful controlled burn. (To find the upper and lower limit of intensity (I) for your calculation of a controlled burn use the table of information on the previous page.)

Lower limit

$I = H \times W \times R$

$W = \frac{I}{(H \times R)}$

W = _____ kilograms per square metre

Upper limit

$I = H \times W \times R$

$W = \frac{I}{(H \times R)}$

W = _____ kilograms per square metre

7 The fire intensity and speed are also affected by some other factors. Describe how you think each of the following factors will affect a fire:

a fuel moisture level

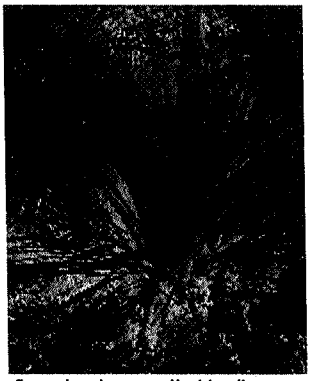
b weather conditions, wind speed and direction

c topography (shape of the land).

Fire in the Australian Landscape

Points covered:

- Why are there frequent fires in Australia?
- How are Australian plants able to survive fires?
- How do fires benefit some native plants?
- How should we manage fires?



Cycad palm engulfed by flames.
Photo: Nature Focus

Over the last 15 million years, Australia has become increasingly drier. As a result, fires have become a more frequent and important part of Australia's natural landscape. In fact, many Australian plants need fire to survive.

Some Australian plants have developed adaptations to help them survive fires. For example, mallee eucalypts have large underground roots (lignotubers) which enable them to regenerate after fires. Also, many eucalypts are able to grow new leaves and branches from burnt trunks.

Some plants are so well adapted to fire that fire is both an advantage and, in some cases, a necessity for survival. Fires remove competing plants, open up the canopy to greater sunlight and enrich the soil with ash from the previous generation of plants. This creates ideal conditions for the growth of certain short-lived but fast-growing species, such as acacias. Further, some plants have seed capsules that only release their seeds after being singed or seeds that need to be scorched to germinate.

However, people try to manage fires in ways that may be inappropriate to maintain maximum biodiversity. They may burn the bush more often than would occur naturally or try to prevent fires completely. These fire regimes can have profound consequences for the native vegetation and animals.

Humans have been using fire to manage the Australian landscape for tens of thousands of years. Today fire is being used increasingly to promote long-term biodiversity. This requires a good understanding of the relationship between fire and biodiversity in the Australian landscape, and a clearer understanding of what we want to achieve with our modern burning regimes.

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